possessors of notable eugenic qualities—let us for brevity call them "Eugenes"—will form their own clubs and look after their own interests. It is impossible to foresee what the state of public opinion will then be. Many elements of strength are needed, many dangers have to be evaded or overcome, before associations of Eugenes could be formed that would be stable in themselves, useful as institutions, and approved of by the outside world.

The suggestion I made in the earlier part of this paper that the executive committee of local associations should cooperate, wherever practicable, with local administrative authorities, proceeded on the assumption that the inhabitants of the districts selected as the eugenic "field" had a public spirit of their own and a sense of common interest. This sense would be greatly strengthened by the enlargement of mutual acquaintanceship and the spread of the eugenic idea consequent on the tactful action of the committee. It ought not to be difficult to arouse in the inhabitants a just pride in their own civic worthiness, analogous to the pride which a soldier feels in the good reputation of his regiment or a lad in that of his school. By this means a strong local eugenic opinion might easily be formed. It would be silently assisted by local object-lessons, in which the benefits derived through following eugenic rules and the bad effects of disregarding them were plainly to be discerned.

The power of social opinion is apt to be underrated rather than overrated. Like the atmosphere which we breathe and in which we move, social opinion operates powerfully without our being conscious of its weight. Everyone knows that governments, manners, and beliefs which were thought to be right, decorous, and true at one period have been judged wrong, indecorous, and false at another; and that views which we have heard expressed by those in authority over us in our childhood and early manhood tend to become axiomatic and unchangeable in mature life.

In circumscribed communities especially, social approval and disapproval exert a potent force. Its presence is only too easily read by those who are the object of either, in the countenances, bearing, and manner of persons whom they daily meet and converse with. Is it, then, I ask, too much to expect that when a public opinion in favour of eugenics has once taken sure hold of such communities and has been accepted by them as a quasi-religion, the result will be manifested in sundry and very effective modes of action which are as yet untried, and many of them even unforeseen?

Speaking for myself only, I look forward to local eugenic action in numerous directions, of which I will now specify one. It is the accumulation of considerable funds to start young couples of "worthy" qualities in their married life, and to assist them and their families at critical times. The gifts to those who are the reverse of "worthy" are enormous in amount; it is stated that the charitable donations or bequests in the year 1907 amounted to 4,868,050*l*. I am not prepared to say how much of this was judiciously spent, or in what ways, but merely quote the figures to justify the inference that many of the thousands of persons who are willing to give freely at the prompting of a sentiment based upon compassion might be persuaded to give largely also in response to the more virile desire of promoting the natural gifts and the national efficiency of future generations.

ZOOLOGY AT THE BRITISH ASSOCIATION.

The Rule of Priority in Zoological Nomenclature.

MR. G. A. BOULENGER expressed disapproval of the extreme application of the rule of priority in zoological nomenclature on the ground that it had already produced much mischief under the pretence of arriving at ultimate uniformity. The worst feature of the abuse of this rule is not so much the bestowal of unknown names on well-known animals as the transfer of names from one to another, as in the case of Astacus, Torpedo, Holothuria, Simia, Cynocephalus, &c., so that the names which were uniformly used by Cuvier, Johannes Müller, Owen, Agassiz, Darwin, Huxley, and Gegenbaur would no longer convey any meaning; very often they would be misunderstood, and the very object for which Latin or Latinised names were introduced would be defeated. While considering uniformity in the future, it was surely important to have some consideration for the past; the speaker suggested that names with which all general zoologists are familiar should be protected from the revisers of nomenclature, and that it might be possible for committees to be appointed to determine, group by group, which names are thus to be respected, not necessarily on the ground of their earliest date or their correct application in the past, but as having been universally used over a long period in a definite sense. Mr. Boulenger's proposals were supported by several subsequent speakers, and the section agreed that a resolution, in the sense of and containing the manifesto published in NATURE, vol. lxxviii., p. 395, be communicated to the principal British zoological societies, to Section C, and to the British representative on the committee of nomenclature of the International Congress of Zoology.

The Determination of Sex.

A discussion, jointly with Section K, on the determination of sex, was opened by Mr. L. Doncaster. After briefly reviewing some of the recent work on the nucleus in this connection, he proceeded to describe a series of breeding experiments with the moth *Abraxas grossulariata* and the rare variety *lacticolor*, and concluded that the explanation of the results which he had obtained must be as follows:—(1) the sex determinants behave as Mendelian characters, maleness and femaleness being allelomorphic with one another, and femaleness dominant; (2) all females are heterozygotes, carrying recessive maleness, and producing male-bearing and female-bearing eggs in equal numbers; all males are homozygous, carrying only maleness and producing only male-bearing spermatozoa; (3) the *grossulariata* character cannot be borne by a female-bearing gamete.

Mr. W. Heape insisted that external circumstances, such as nutrition and general metabolism, could alter the proportion of the sexes in the young born.

Miss N. M. Stevens described her work on the spermatogenesis of several insects, devoting particular attention to the heterotropic chromosomes, in regard to which she confirmed Wilson's conclusions.

Prof. Bateson described Miss Durham's experiments with the cinnamon canary. When a cinnamon male is paired with a green female, all the males are cinnamon and the females green, but when a cinnamon female is paired with a green male all the offspring, of both sexes, are green. He then proceeded to consider a similar but less simple case, investigated by himself and Mr. Punnett, namely, the silky fowl, in which two pairs of allelomorphic characters are concerned in addition to the sex determinants. Both these cases are explicable on similar lines to those suggested for Abraxas. He gave instances of sex-limited inheritance, such as colour-blindness and hæmophilia in man, in which the males are affected and can transmit, while unaffected males cannot, but unaffected females may do so, the explanation being that the disease is dominant in the male and recessive in the female.

Dr. Copeman mentioned experiments which seemed to suggest that chemical factors may be important in sex determination, and a subsequent speaker referred to some sixty cases of old hen pheasants assuming male plumage as supporting the view that here it is the female which is heterozygous in sex, the male being homozygous, as no case of a male bird assuming female plumage was met with.

Account of the Recent Expedition to Lake Qurun.

Dr. W. A. Cunnington gave an account of the results of the investigation, by Mr. C. L. Boulenger and himself, of the Birket el Qurun in the Fayum province of Egypt. The lake, though still of considerable size—twenty-five miles long and five or six miles in maximum breadth—is much smaller than formerly; raised beaches are seen in many parts, and the water is shallow (nowhere more than 4 to 5 fathoms deep) and brackish. The lake was found to be well stocked with animal life, although the

number of species is not large. The large quantities of Entomostraca—principally copepods and Cladocera—doubtless form the food supply of the fishes, which occur in astonishing abundance; fifteen species of fish were obtained, all of which are well-known Nile forms. The swampy pools on the margin of the lake yielded ostracods, hydrachnids, and spiders. The Mollusca obtained belong to eleven species—two only of which are lamellibranchs—all of which are Nilotic forms. *Paranais littoralis*, a small oligochæte, was the only aquatic worm obtained, no leeches or Turbellaria being seen. Cordylophora was found growing in great abundance in the lake, an interesting fact, as it has not previously been recorded from Africa. Of especial interest are the presence in the lake of (1) a gymnolæmatous polyzoon with a circular lophophore and eight tentacles, and (2) a medusa and the associated hydroid stage—*Moerisia lyonsi*—which appear to bear a resemblance to Sarsia. Mr. Boulenger added further details regarding Mœrisia, and discussed its importance in relation to the possible former history of the lake.

Structure of Dendrosoma radians.

Prof. S. J. Hickson and Mr. J. T. Wadsworth conclude that the bodies described by Kent as the "exogenously produced germs" of Dendrosoma are epizoic, or possibly parasitic, Acinetaria belonging to the genus Urnula. The only true reproductive bodies of Dendrosoma are the so-called internal buds or gemmulæ, first described and figured by Levick. The micronuclei of Dendrosoma are 4 μ in diameter when they have reached their full size; when in division the length of the spindle is 24 μ, and the chromosomes are numerous and minute. No centrosomes were seen, nor has conjugation been observed.

Haematozoa from Ceylon Reptiles.

Miss Muriel Robertson described several Hæmatozoa from Ceylon reptiles. The multiplication of *Haemogregarina nicoriae* takes place in tortoises (Nicoria and Emyda), and the transmitting host is a species of Branchellion, in the alimentary canal of which the hæmogregarine becomes motile. *Trypanosoma vittatae* and *Haemogregarina vittatae* are found in *Emyda vittata*, and the transmitting host of both is a species of Glossiphonia. Other hæmogregarines, trypanosomes, and a Hæmocystidium were described from lizards (*e.g.* Hemidactylus). (Other papers on trypanosomes and Piroplasma were given before a joint meeting of Sections D and I; for an account of these see "Physiology at the British Association," NATURE, October 8, p. 593).

Giant Nerve Cells and Fibres of Halla.

Dr. J. H. Ashworth described the structure and histology of the giant nerve cells of the polychæte *Halla parthenopeia*. These cells, of which there are usually fifteen to eighteen in each worm, are distinguished by their large size (they may attain a diameter of 150 μ) and thick sheath. Fine chromophilous granules are present in the protoplasm (except in a peripheral zone, from which they are almost or quite absent) in varying amount in different giant cells. They are found in greatly increased mass in a specialised perinuclear zone, the outer edge of which is bounded by the perinuclear network of neurofibrillæ, which is thus in a position which facilitates its rapid nutrition. In the general protoplasm of the cell there is a network of neurofibrillæ, generally wider meshed and more slender stranded than the perinuclear network. From the intracellular network slender, primitive fibrils pass towards the giant fibre, and several stouter fibrillæ—six to ten from small cells, twelve to thirty from large cells—each formed by the fusion of several primitive fibrils, pass into the giant fibre, forming a bundle which occupies from one- to three-fourths of the lumen of the fibre. The fibrillæ in the giant fibre are generally of the same thickness, but occasionally one, two, or three fibrils are thicker than the rest. The contents of the giant fibre are equivalent and have a similar structure to the axis cylinder of a medullated nerve fibre, except that in the former there is nothing comparable to the nodes of Ranvier of the latter.

The Vascular System of Stylodrilus.

Mr. R. Southern directed attention to certain features of the vascular system of a new species of Stylodrilus from the River Annalee, co. Cavan. This differs from all other species in the presence of simple contractile saccular appendages on the posterior portion of the dorsal vessel, a condition intermediate between that seen in normal lumbriculids and that in the aberrant genus Stylodrilus. The relations of the dorsal and ventral vessels to the intestinal blood sinus were also described, and shown to differ considerably from those usually met with in oligochætes.

The Respiration of Land Isopods.

Mr. E. E. Unwin pointed out that woodlice are derived from aquatic ancestors, and, having taken to terrestrial life, have adapted their respiration to their altered environment. The different kinds of woodlice are, according to the speaker's experiments, suited to different degrees of dryness; *e.g. Trichoniscus pusillus* soon dies unless kept very damp, while *Porcellio scaber* can live four or five days in a dry box. *Ligia oceanica, Trichoniscus pusillus, Oniscus asellus, Porcellio scaber,* and *Armadillium vulgare* are arranged in order according to their habitat, and the structure of their respiratory organs shows a corresponding gradation from simple gills to gills supplemented by air tubes ramifying through some of the abdominal exopodites.

The Distribution of Irish Fresh-water Mites.

Mr. J. N. Halbert contributed some notes on the distribution of Irish fresh-water mites (Hydrachnida), pointing out that they may be divided, like the fresh-water mites in general, into two great faunistic groups:—(1) a group containing those widely distributed species which inhabit standing and slowly flowing waters of a comparatively high temperature, and (2) a group embracing those forms which are found in waters of a constantly lower temperature, especially those of cold highland lakes and streams.

Arctic and Antarctic Collembola.

Prof. G. H. Carpenter pointed out the comparative richness of the collembolan fauna of the remote northern and southern lands. The Poduridæ and Isotominæ are believed to be nearest to the primitive stock of the order, while the Entomobryinæ, the Tomocerinæ, and the Symphypleona are more highly specialised. It is suggestive that in both Arctic and Antarctic faunas the primitive genera are well represented, while the specialised genera have very few species. Two Arctic isotomines are present in our own islands—*Agrenia bidenticulata*, found last year in Irish and Scottish mountain streams, and *Proisotoma beselsii*, which inhabits the Arctic regions of both the Old and New Worlds and the coast of Scotland. "Bipolarity" in the Collembola is shown by Wahlgren's record of the latter species from Tierra del Fuego; a closely allied form is present in the South Orkneys. Such distribution indicates a high antiquity (probably Mesozoic) for this form. Several genera are apparently confined to the southern regions; for instance, Cryptopygus is represented by identical or nearly allied species in Tierra del Fuego, Graham Land, South Shetland, South Orkneys, and South Georgia, while *Isotoma octo-oculata* is present in Graham Land, South Shetland, South Orkneys, and Kerguelen, and the Isotoma of South Victoria Land is closely allied to a Fuegian species. Such distributional facts suggest the considerable geological age of the springtails and a former wide extension of the Antarctic continent. The National Antarctic (*Discovery*) Expedition collected from moss at Granite Harbour, South Victoria Land, a remarkable springtail, referable to the Poduridæ, but showing some striking affinities to the Isotominæ, which is apparently the most southerly terrestrial animal yet known.

Mimicry in Lepidoptera.

Dr. F. A. Dixey pointed out that when Fritz Müller put forward, in 1879, his theory of common warning colours, or the assimilation of one distasteful form to another for the sake of mutual protection against insectivorous enemies, he recognised the probability, or

even certainty, that the approach would not necessarily be one-sided, but might be convergent, each form in some respects advancing to meet the other. This suggestion, however, was never developed by Fritz Müller, for although he mentioned a few instances in support of his view, he did not attempt to trace the supposed mutually mimetic process in any detail. Dr. Dixey showed that there is much evidence that such reciprocal approach, or interchange of obvious characters—for which the term diaposematism has been proposed by Prof. Poulton—does actually occur, and he exhibited some cases of mimicry the peculiar features of which are difficult to explain on any other hypothesis.

Prof. E. B. Poulton exhibited and described specimens illustrating mimicry in the butterflies of North America, and then proceeded to give an account of some recent investigations upon the African swallowtail, *Papilio dardanus* (*merope*), as an example of mimicry.

Mr. J. C. Moulton exhibited four groups of South American butterflies to illustrate the Müllerian theory of mimicry. In the Venezuelan group the general warning pattern consists of a chestnut background relieved by transverse black bars and yellow apical markings on the forewings. In the other groups the pattern is modified in various ways according to the environment; for example, in the Trinidad group yellow takes the place of the chestnut background, while the group from Ega, on the Upper Amazon, presents a more mottled and richer brown appearance, and in the fourth group, from Ecuador and Peru, the bars and mottled markings have given place to a dark background relieved only by a broad, oblique chestnut band.

The Development of Littorina.

Mr. W. M. Tattersall briefly described the development of several species of Littorina. The eggs of *L. littorea*, each enclosed in a hat-shaped capsule, are laid freely on the shore, and not aggregated together in a gelatinous mass. The larva leaves the egg as a trochosphere, and passes through a veliger stage to the adult. *L. littorea* lives low down on the shore among Laminaria and *Fucus serratus*. *L. obtusata* lives in a higher region of the shore, in the zone of *Fucus vesiculosus*; its larva leaves the egg as a veliger. *L. rudis* and *L. neritoides*, both of which live near high-water mark, are viviparous. Thus within the limits of a single genus there are presented three stages in the evolution of land Mollusca from marine forms, showing specialisation in reproduction and gradual abbreviation and final suppression of larval stages, correlated with successive stages of specialisation of habitat.

Gastrulation in Amphioxus.

Prof. E. W. MacBride pointed out that two theories have been advanced as to the mode in which the germinal layers are formed in Amphioxus:—(1) that the invagination is a simple process, and that the whole of the invaginated layer is endoderm from which notochord and mesoderm take their origin by a process of folding (as held by Kowalevsky, Hatschek, Samassa, and MacBride); (2) that the invagination is a double process; on the ventral side of the blastopore the cells are true endoderm, while on the dorsal side they are ectoderm (as held by Cerfontaine), and that the ectodermic roof of the archenteron becomes used up in the formation of the notochord and mesoderm, which are cut out of the wall of the archenteron by the upgrowth of the true endoderm cells at the sides. Prof. MacBride's observations lead him to conclude that all the intucked cells are endoderm, that the mesoderm originates from a dorso-lateral fold of the endodermic wall, which becomes cut into anterior and posterior halves by the growth of a septum; both halves of the fold remain open into the gut. The front half becomes eventually closed off, and corresponds to the mandibular head-cavity of other vertebrate embryos and to the collar-cavity of Balanoglossus. The posterior division, corresponding to the lateral plate of mesoderm of other vertebrate embryos and to the trunk cavities of Balanoglossus, retains its connection with the gut for a longer time; from its front end the somites of the body are cut off. The head cavities arise still later as a single median invagination of the anterior gut wall, which, before it separates from the gut, begins to be divided into right and left halves. The speaker concluded that, with some slight modifications, the simple view of the development of Amphioxus held by Kowalevsky and Hatschek was to be maintained.

The Early Development of Dasyurus.

Prof. J. P. Hill gave an account of the early development of the native cat (of southern Australia)—*Dasyurus viverrinus*. The uterine ovum is of large size as compared with the ova of Eutheria, is enclosed in a shell membrane, and exhibits a marked polarity, its lower pole consisting of dense, finely granular cytoplasm in which the pronuclei are situated, and its upper pole of a delicate reticulum with fluid-filled meshes. Prior to cleavage this latter portion of the ovum is separated off and takes no further part in development. The fluid material in this non-formative portion of the ovum is to be regarded as the product of an abortive attempt at the formation of a solid yolk-mass. By its elimination the potentially yolk-laden telolecithal ovum becomes converted into a secondary homolecithal homoblastic one. The first three cleavage planes are meridional; the resulting eight blastomeres are of equal size, and form an equatorial ring. The ensuing divisions (fourth cleavage) are parallel to the equator and are unequal, each of the eight blastomeres becoming divided into an upper, smaller, and clearer cell with relatively little deutoplasm, and a lower, larger, and denser cell with well-marked deutoplasmic contents. A sixteen-celled stage is thus produced in which the cells are arranged in two superimposed rings, each of eight cells. The descendants of these two cell-rings gradually spread towards opposite poles in contact with the thickened shell membrane, and constitute the cellular wall of the blastocyst, which is unilaminar, and remains so until the vesicle attains a diameter of 4–5 mm. The upper cell-ring is regarded as furnishing the formative (embryonal) portion of the vesicle wall—the homologue of the embryonal knot of the eutherian blastocyst—from which are derived the embryonal ectoderm and the entire endoderm, while the lower ring gives rise to the extra-embryonal portion of the vesicle wall, the trophoblastic ectoderm. The markedly different mode of formation of the blastocyst in the Eutheria was regarded as correlated with the complete loss of the shell membrane in the course of their phylogeny.

The Wild Ancestors of Domestic Horses.

Prof. J. C. Ewart gave an account of the wild ancestors of domestic horses, dealing particularly with (1) *Equus sivalensis* of northern India, a long-limbed form with the face strongly bent downwards; (2) *E. prejvalskii*, the horse which still lives in a wild state in Mongolia; (3) *E. robustus*, the remains of which occur at the Palæolithic settlement of Solutré, north of Lyons; and (4) *E. gracilis*, of the Auvergne and other French Pleistocene deposits, which seems to have given rise to *E. caballus libycus* (Ridgeway) of north Africa and to the Celtic pony (*E. caballus celticus*) of north-western Europe. Dr. Scharff mentioned that the horse remains found in the Irish crannogs, bogs, and caves bore out Prof. Ewart's view that a wild horse formerly existed in Ireland, of which the present-day Connemara pony seems to be the direct descendant.

Feeding Habits of British Birds.

Mr. C. Gordon Hewitt advocated the institution of an inquiry into the feeding habits of British birds, and urged that, in order to obtain as accurate a conception as possible of the economic status of any species of bird, it was necessary to examine and record the contents of the crop and stomach of a large number of individuals killed, not only in different months of the year, but also in different localities. Such evidence would provide the only safe guide to the protection of wild birds.

Dr. C. J. Patten gave an account of the migratory movements of certain shore birds, especially the sanderling and turnstone, as observed on the Dublin coast, and showed skins illustrating the phases of plumage changes according to sex, age, and season.

Prof. W. A. Herdman gave some natural-history notes

on the Ceylon pearl oyster. These dealt with (1) the kind of ground on which the oysters live and the objects to which they are attached; (2) the oyster-eating fishes and other enemies which affect the life of the oyster; and (3) the different types of oyster and the question of their constancy.

Dr. A. Smith Woodward gave a lecture on the evolution of fishes. Prof. R. J. Anderson gave details respecting (1) the epiphyses of long bones, chiefly in sauropsids, and (2) measurements of the maxilla in Mammalia. Prof. Alexander Fraser directed attention to some points connected with the alimentary canal of the higher mammals, and Dr. H. E. Roaf gave a summary of his experiments on the physiological action of the digestive enzymes of certain invertebrates, but these communications cannot be summarised in the space here available.

J. H. ASHWORTH.

ENGINEERING AT THE BRITISH ASSOCIATION.

THE president of the section of engineering, Mr. Dugald Clerk, is so well known for his researches on the gas engine, and has done so much to place the theory of gas-engine work upon a true scientific basis, that it was only to be expected that the work of Section G should be largely concerned with gas-engine practice and allied industries. The president in his address gave an instructive and valuable summary of the early history of the study of thermodynamics, and of the application of its principles to engine design.

After the presidential address on Thursday, September 3, only one paper was dealt with, that by Mr. G. Stoney, on recent developments in steam turbines. At the York meeting in 1906 Mr. Stoney read a paper on the same subject, and the present paper, which was a continuation of the former, showed conclusively how rapid the progress had been during the past two years. The author first dealt with the changes in the design of continuous-current dynamos to adapt them to the high speed of the turbine, and stated that now as much as 1500 kw. was put into a single armature. In turbo-blowers for blast-furnace work there had been a great advance; a blower to deliver 20,000 cubic feet of air per minute only weighed 25 tons, against 450 tons for the ordinary reciprocating engine of the same capacity. The use of the exhaust steam from non-condensing reciprocating steam engines in turbines, which took in their steam at atmospheric pressure and exhausted it into condensers, was then dealt with, and such refinements as mixed-pressure turbines, where a high-pressure turbine using boiler steam comes automatically into action when the low-pressure steam supply fails. Improvements in condensers to increase the available vacuum—such a very important matter in turbine economy—were then touched upon, and, finally, the wonderful advance in the application of the turbine to marine work was briefly discussed—in eight years the horse-power so utilised had increased from 25,000 to 1,750,000.

Friday, September 4, was entirely devoted to a joint discussion with Sections A and B of the first report presented by the committee of the section on gaseous explosions, which was appointed at the Leicester meeting in 1907. This report not only summarised in a convenient form for reference what was known up to the present time on the subject, but also described the experimental work which had been carried out by various members of the committee. While Boyle's law might be considered holding under all the conditions met with in gaseous explosions in the gas engine, it had long been realised that it was probable that the law $PV=kT$ did not hold at the high temperatures reached in such explosions. The experimental work on this question was divided in the report into three classes:—(*a*) constant-pressure experiments; (*b*) constant-volume experiments; and (*c*) experiments in which both volume and pressure were varied; those carried out by Mr. Dugald Clerk fell into this last class. The results obtained by the various experimenters were fully discussed in the report, and from data obtained from several of the best-known experiments curves were drawn showing the relation between the temperature in degrees centigrade and the energy in calories per gram molecule. As a result of its investigations the committee had prepared a table giving the energy at four different temperatures in calories per gram molecule of air, CO_2, H_2O, gas-engine mixture, and ideal gas, and curves were drawn for the gas-engine mixture and the ideal gas. In the form of an appendix to the report was a valuable note, by Prof. H. L. Callendar, on the deviation of actual gases from the ideal state, and on experimental errors in the determination of their specific heats. Prof. Callendar showed that there was a possible systematic error inseparable from experiments made by Regnault's methods, due to the fact that the correction required for the flow of heat by conduction from the heater to the calorimeter had to be based upon experiments made with no gas passing. A long and interesting discussion took place, the chief speakers being Dr. Harker, Prof. Harold Dixon, who has done such excellent work in the determination of the specific heats of gases at high temperatures, Prof. Dalby, Prof. Coker, who described the method by which he had determined the fluctuation of temperature on the inner surface of the cylinder wall of a gas engine, and Prof. Bernard Hopkinson, who stated that in his experimental work he had discovered that the gases at the moment of combustion were able to radiate a considerable quantity of heat. The discussion was closed by the president of Section G, who expressed the view that the experimental work which is now being carried out by Prof. Callendar and Prof. Dalby, which was referred to by the latter gentleman in the discussion, would be of very great importance. Prof. Callendar and Prof. Dalby in their experiments on the determination of temperatures inside gas-engine cylinders used an extremely fine platinum wire, and withdrew it from the cylinder during the time the temperature was at its maximum, and, as a result of their work, they believed they had obtained temperatures accurate to within 1° C.; if the temperature is known accurately at one point of the indicator card, it could certainly be calculated for other points.

On Monday, September 7, the first three papers were devoted to peat and producer gas. Captain Sankey read the first paper, on the utilisation of peat for the making of gas or charcoal. He stated that the subject was one of great importance to Ireland, and was of interest in view of the fact that a Bill had been passed by Parliament sanctioning works to produce gas from peat, and to use this gas for making electricity by means of gas engines and dynamos, and to distribute the power thus generated to works which would be established in the neighbourhood of the power station. The Bill had given power to utilise a portion of the bog of Allan, near Robertstown, on the Grand Canal, about twenty-five miles from Dublin. Earlier attempts to utilise peat had failed, because they were based on the use of dry peat, that is, peat containing 25 per cent. of water, and the cost of such drying and of converting the dry material into briquettes was too great to allow it to compete with coal, and, further, there was no recovery of by-products. The proposed scheme proceeded on different lines; the peat would only be partially dried, that is, to about 60 per cent., and it would then be used in producers for generating gas, and the by-products would be recovered. It was hoped that the profits on these would cover the cost of procuring and drying the peat. Great progress had been made in Germany in the utilisation of peat, and the author described several plants he had seen at work. The peat could be obtained by four different methods:—by hand labour entirely, by cutting by hand and then shovelling it into an elevator, or by digging it and spreading it for drying by a machine, or, finally, the peat could be dug by means of an ordinary grab, which was the method adopted at Schelecken, in Prussia. Probably the grab method would be the best for the proposed power scheme, and the drying might be carried out by means of Dornberg presses. The principal by-product in the manufacture of peat gas is sulphate of ammonia, and the proposed power station would probably be able to produce about 3000 tons per annum. Other important by-products are acetate of lime, methyl alcohol, and tar; an excellent waggon grease can be made from this tar. The author estimated that the monetary value of these